ON THE PSYCHOLOGY AND PEDAGOGY OF THE BLIND

By Arthur R. T. Wylie

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HISTORY OF THE BLIND.

The history of the blind before 1784 is one of "legends, suffering and individual gropings." Since that time we have the invention and application of means and methods of education for them.

History has very little to tell us of these unfortunates except now and then to record the name of some blind genius who aroused the astonishment of his contemporaries. The earliest ones of which we hear are the blind theologian Didymus of Alexandria and the poets Bashar who flourished in the 7th century and Aboul-Ola-Hamid-Ben-Soliman. Thus the Orient gives us the first records.

Judging by their medical treatises the blind must have been numerous during Roman times but no methods of instruction have come down to us. Diogenes Laertius relates that several philosophers deprived themselves of sight in order to meditate more easily. Diodorus was a philosopher and musician and taught geometry and was noted for his clear demonstrations. Aufidius wrote a Greek history. Didymus, the teacher of St. Jerome, lost sight at five years and became a noted theologian and mathematician as well as a professor at Alexandria. His most noted work is a "Treatise on the Holy Ghost."

The first charitable institution of which we have any record was a hospital established by St. Basile at Cesarea in Cappadocia in the 4th century. In the following century St. Limnee organized a refuge at Syr in Syria, and about 630 a typhlocominus was established at Jerusalem. St. Bernard, Bishop of Mans, established an institution for the blind in the 7th century.

But these leadings were not followed up and the blind were left to become beggars at churches and by the waysides, which seems to have been the chief way for caring for these unfortunates until very recent times.

In 1260 Louis IX founded the Hospice des Quinze-Vingts, a retreat for three hundred blind paupers, hence the name.

However they were often subjected to inhuman treatment from the rough manners of the times. We are told that in 1425 Charles VII placed four blind men in full armor and armed with clubs in a fenced inclosure with a large hog which was to be given to the one who would kill it. In attempting to do this they were said to have given each other such blows but that for the armor they would have been killed. The court of Charles is reported to have been highly amused by this spectacle.

However, in Japan the blind were more highly esteemed, for Charlevoix in his History of Japan tells us that the history and annals of the empire were confided to the memory of the blind who communicated their knowledge to the following generation and thus formed an unbroken tradition which no one would contradict. They had their Academy where they were taught, where exercises were given to cultivate the memory and from which they received degrees. They also turned portions of the history into verse and adorned it with music. They had their special officers and received great "consideration."

Nicaise, of Malines, blind from the age of three, taught canon and civil law at the University of Cologne, quoting long passages from memory; he became a priest and preached the remainder of his life, dying in 1492. James Schegkins, who died in 1587, taught philosophy and medicine at Tübigen for thirteen years. To the oculist that offered him aid when he lost his sight he replied that "he had seen many things in life he would rather have not seen, and would even have wished on some occasions that he had been deaf." Asconius wrote a treatise on grammar. The 14th century produced the blind poet Loedini in Italy, the philosopher Ferdinandus de Bruges, Bruman the musician, and Herman Correntier famous for learning. In the next century we find Commenius the mathematician, and the poet Malaval in France, in Germany, Professor Schoenberg. In the 18th century there flourished Moyses the chemist, Stanley the musician, Blacklock the poet in England, and Kleinhaus the sculptor, and Kennedi and Koeperli the artisans in Germany. These instances simply served to show what great minds could do even under great difficulties and they would indicate that possibly lesser minds might be educated if the proper means were used to this end, but they gave no indication as to what these should be. However, Jerome Cardan an Italian physician, who flourished during the middle of the 16th century, had conceived the idea that the blind could be taught to read and write by means of touch and cited Erasmus as supporting the view.[1] And in 1575, we find Francesco

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[1] There is no reference to this in the works of Erasmus.

Lucas in Spain, and Rampazzetto in Italy, had made use of large concave letters cut in wood, both singly and in groups, for instruction of the blind.

In 1646 appeared the first book which called attention to the condition of the blind. It was published in Italian and French under the title "L'Aveugle affligé et consolé." In 1670 appeared a book on the instruction of the blind by Lana Terzi, a Jesuit.

Six years after this Mlle. Elizabeth Waldkirch, of Geneva, was taught to read by Jacques Bernoulli, a Swiss savant, but the means of her instruction were not made known.

Bishop Burnet, of Salisbury, tells us in his "Journeys in Switzerland" of Mlle. Walkier, of Shaffenhausen, who had lost her sight when one year old but "spoke five languages, was a theologian, a philosopher, and a good musician. She learned to write by means of hollow characters cut in wood which she passed over with a sharp pointed iron. Afterwards she made use of a pencil and when the bishop saw her, in 1685, she wrote rapidly and correctly."

In 1690 appeared Locke's Essay on Human Understanding in which he attempted to deduce all our knowledge from experience. Consequently he was much interested in a question that his friend Molineaux proposed, as to whether a man born blind if made to see on becoming an adult could distinguish by sight a cube from a sphere if both were of the same metal and color. In discussing the subject that judgment often changes our "ideas of sensation," Locke takes up this question and agrees with Molineaux in answering it in the negative. "For," he says, "although he has obtained the experience of how a globe, how a cube affects his touch; yet he has not yet obtained the experience that what affects his touch so and so must affect his sight so and so."

In 1703 Leibnitz took up the question but came to different conclusions from those of Locke.

A few years after this Saunderson, the blind mathematician, was exciting the wonder of England. Having pursued classical studies with success he was drawn to mathematics. He was obliged from lack of means to give lectures which we are told were well attended. He published an Elements of Algebra which is said to have been "full of singular demonstrations." On the recommendation of Sir Isaac Newton he was appointed to the professorship at Cambridge which Newton himself had vacated only a short time before. Here he expounded the works of Newton on light and optics with great success, the clearness of his demonstrations exciting the surprise and admiration of his hearers. He was given the degree of Doctor of Laws by the order of George II.

We are told that his morals did not correspond with his talents, and although his excesses tarnished his great name yet his fame lived for a century after him. He died in 1739 at the age of 56. His chief interest for us lies in his invention of a calculating board. This was made of wood a foot square. It was divided into little squares by means of parallel horizontal and vertical grooves, thus giving both vertical and horizontal columns. In the center of each little square was a hole, likewise at each corner and in the middle of each side. He provided himself with two sizes of pins which when properly placed in these holes represented figures, each square standing for one digit. Thus a big pin in the center of the square meant zero while a small pin meant one. A large pin in the center and a small one directly above meant two, or if in the superior right hand corner three, etc. By means of this he was able to work out all of his calculations. The same board with the addition of silk threads he used for geometrical demonstration. In 1747 a biography of Saunderson was published in Dublin by his pupil, Wm. Hinchleff, which contained a full description of the appliances used by this blind mathematician. This book we are told "was most eagerly read in France."[1]

The answer of Locke to the question of Molineaux not long afterward received experimental confirmation. In 1728 Wm. Chesselden published in the Philosophical Transactions an account of a case that he had couched for congenital cataract. And although the patient had been able to distinguish day and night and see color in a very strong light yet he did not know color after the operation. "He did not know the shape of anything nor any one thing from another however different in shape or magnitude." And it was only after long experience that he could distinguish by sight his old friends the cat and dog.[2]

Condillac in his "Traité des Sensations et des Animaux," where he treats of his famous statue, takes up the question of Molineaux and Locke and calls attention to the fact the specification of the size and color of the objects was unnecessary since it would be a contradiction to think that he could judge of size and distance and not of form. He also gave a fuil discussion of the observations and results of the Chesselden case.[3]

Condillac was a follower of Locke but in his Traité des Sensations he went beyond his master and made sensation the sole origin of human knowledge. Voltaire called him the "great philosopher." His work became immensely popular and was taught in the public schools and academies of France, so that the philosophy of Condillac was the philosophy of France during the Revolution and under the Empire.

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[1] Morley says that such a book does not nor ever has existed.

[2] Phil. Trans., April, May, June, 1728.

[3] Oeuvres Completes. T. III, p. 233. Paris, 1821.

The Abbé Deschamps in a work on the education of the deaf also outlined a method of teaching the blind to read and write.

In 1738 Voltaire published a book in which he popularized the work of Newton, and also gave a statement of Berkeley's theory of vision and a discussion of the Chesselden case. Ten years later Réaumur couched a girl for congenital cataracts. Diderot sought admission to this operation but was refused. His disappointment was not great, however, for on a little reflection he decided that only very meager results could be gained from questioning the patient for she would not have sufficient intelligence and skill in observation to make her answers valuable. Hence, he concludes that more could be gained by questioning the intelligent blind. As a result of his meditation on this case he published in 1749 his "Lettre sur les aveugles à l'usage de ceux qui voient." The aim of this Letter was to show "that all knowledge is relative to intelligence; that thought is not the measure of existence, nor the conceivableness of a proposition the test of its truth, and that our experience is not the limit of the possibility of things." Having thus grasped the doctrine of relativity he used it against the standard organization of the time which "made anthropomorphism and the absolute the very base and spring alike of individual and social life."

The Letter is an inquiry of how far the loss of one sense would involve a corresponding modification of the ordinary notions. Diderot paid a visit to Lenôtre du Puisseau the most famous blind-man of the time. He was a son of a professor of the University of Paris and had himself taken courses in chemistry and botany. Afterward he went to Puisseau where he established a distillery and went yearly to Paris to dispose of the products. He slept during the day and worked at night "because he was not then disturbed by anybody." Diderot asked him his idea of an eye and of a mirror. He replied that he thought an eye was "an organ upon which the air produces the same effect as the staff on the hand" and that a mirror was a "machine by which objects are placed in relief outside of themselves." Diderot shows how these ideas are reached by applying the known to the unknown and then asks the question of how many philosophers do the same, with the inference that their results are about as valuable.

He finds that the blind have a greater memory for sound than seeing people and that they notice differences in sound that are neglected by the seeing. Lenôtre told him that he would think seeing people of superior intelligence if experience had not taught him better. On asking him if he would not be glad to have his sight, he received the reply that "were it not for the mere gratification of curiosity, I think I should do as well to wish for long arms. It seems to me that my hands would inform me better of what is going on in the moon than your eyes and telescopes; and then the eyes lose the power of vision more readily than the hands that of feeling. It would be better to perfect the organ which I have than to bestow on me that which I have not."

In return Lenôtre asked of Diderot some rather strange questions on color, glass, etc., and if the naturalists were the only persons who could see with the microscope and "if the machine which magnified objects was greater than that which diminished them, if that which brought them nearer was shorter than that which removed them to a distance."

Diderot, also, found that the blind have a very slight sense of shame. For Lenôtre clothes were simply to protect the body from the cold, otherwise he had as lief be without them. This leads Diderot to reflect on the relation of sense to morality and that the morality of the blind and deaf both differ from each other and from that of the seeing. He concludes that the acquiring of another sense by us would make as great difference in our moral ideas as the difference between the ideas we now have and those of the blind.

The remainder of the Letter is taken up with a discussion of why a blind man should believe in God. This was a part of the book in which the people were interested and which gained for it its popularity. In discussing the argument from authority Diderot makes use of notions that we now know under the terms, animal variation, adaptation and the struggle for existence.

In another connection he shows that we have signs for the eye and for the ear but none for touch. This, he thinks, is the reason why blind-deaf-mutes are imbeciles and suggests that if a way of communication with them could be devised they could be lead to form ideas, a feat which was accomplished for the first time nearly one hundred years later by Dr. Howe with Laura Bridgman.

For publishing this Letter Diderot was imprisoned for three months in the Vincennes by Louis XV, "nominally because the book was irreligious but really because he had given offense to D'Argenson's mistress by hinting that she might be very handsome but that her judgment on a scientific experiment was of no value."[1] This act aroused great popular indignation and made him the hero of the hour.

While in prison Diderot was visited by Rousseau. Rousseau is reported to have actively aided the movement in favor of the blind and even to have suggested a system of embossed printing. This view, however, appears to be a mistake, since he nowhere makes mention of the subject in his works. But he no doubt lent his influence indirectly, for he was much interested in the education of the deaf and got from it many suggestions for his Émile.

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[1] Morley: Rousseau. II, p. 55.

The individual initiative which was necessary in order that this experience should be of benefit for the whole class of the blind, was aroused seemingly by a matter of accident. In 1783 a restaurant keeper of Paris, in order to stimulate business, procured the services of eight or ten blind men. These he furnished with musical instruments, racks, music books. These men with large leather spectacles on their noses, apparently looking at their music books, regaled the patrons of this café, we are told, with the "most discordant sounds." The venture was immensely successful and the place was known for years afterward as the Café des Aveugles.

One of the spectators at one of these performances, instead of laughing and jeering with the rest, was affected in a much different manner and immediately conceived the possibility of realizing for the blind what had been done for the deaf. He says:

"A very different sentiment from that of delight possessed our soul and we conceived at that very instant the possibility of turning to the advantage of those unfortunate people the means of which they had only an apparent and ridiculous enjoyment. Do not the blind, said we to ourselves, distinguish objects by the diversity of their form? Are they mistaken in the value of a piece of money? Why cannot they distinguish a C from a G in music, or an a from an f in orthography, if these characters should be rendered palpable to the touch? While we were reflecting on the usefulness of such an undertaking, another observation struck us. A young child full of intelligence but deprived of sight listened with profit to the correction of his brother's classical exercises. He often besought him to read his elementary books to him. He, however, more occupied with his amusements, turned a deaf ear to the solicitations of his unfortunate brother who was soon carried off by a cruel disease.

"These different examples soon convinced us how precious it would be for the blind to possess the means of extending their knowledge without being obliged to wait for or sometimes even in vain to demand the assistance of those who see."

This was Valentin Haüy the "father of the blind." He now made a study of the methods and appliances that the blind who had become famous, had made use of in their work and education. He became acquainted with the calculating tablet of

Saunderson. He learned of the raised letters used by the blind man of Puiseaux and Mlle. de Salignac and of the tangible musical characters invented by Lamoroux.

While he was considering these matters a blind pianiste, Mlle. Maria Theresa Von Paradis, of Vienna, came to Paris where she achieved one of the greatest successes of the season. She had been making a concert tour of the Continent and England and everywhere had been received with great enthusiasm but she received her greatest triumph in Paris. Haüy soon made her acquaintance and was shown the appliances she had used in her education. She was the god child of the Empress Maria Theresa and her parents possessed both rank and wealth so no expense was spared in her education. The blind Weissemberg, who had made use of signs in relief and maps made of strings, beads and various glazed sands in his own education, was her tutor. She "learned to spell with letters cut out of pasteboard and to read words pricked upon cards with pins." Baron von Kempelen, the inventor of the speaking automaton and the mechanical chess player, was also her teacher and invented for her a printing press which printed in ink and by means of which she carried on her correspondence. She also had a "large cushion into which she stuck pins to form notes and letters."

On the basis of these observations Haüy developed a scheme for the education of the blind. And in order to see if his ideas were practical he hired a blind beggar, whom he found at the door of the chapel Bonne Nouvelle, to become his pupil. The result was very successful. A paper read by him and an exhibition of the work of his pupil before the Royal Academy of Science created great enthusiasm. Twelve pensionnaires of the Philanthropic Society were turned over to him and with these and his first pupil, Lesueur, he started his first school for the blind in a small house in the Rue Coquillière.

Here the art of embossing books was invented. This again seems to have been a matter of accident as M. Guilliod one of his pupils relates.

"Lesueur was sent one day to his master's desk for some article, and passing his fingers over the papers, they came in contact with the back of a printed note, which, having received an unusually strong impression, exhibited the letters in relief on the reverse. He distinguished an o, and brought the paper to his teacher to show him that he could do so. Haüy at once perceived the importance of the discovery, and testing it further by writing upon paper with a sharp point, and reversing it, found that Lesueur read it with great facility."

And by making a strong impression of the type on tough paper the invention was completed.

But this, like all other important inventions, had been foreshadowed. Letters cut in wood, as we have seen, had early been used for the blind in Italy and Spain. But these were concave and were useless. In 1640 Pierre Moreau, a writing teacher of Paris, had made use of raised letters cast in lead for the blind but the invention came to naught. And by means of some similar device Archbishop Usher had taught his blind aunts to read.

In 1785 the Commission of the Royal Academy presented their report on the work of Haüy and he immediately became the lion of the hour. Musicians and actors gave recitals for the benefit of his pupils and funds came in from all directions.

Haüy and his pupils, the next year, were given an audience by Louis XVI. Haüy became a favorite of the king and was accorded various honors.

It was about this time that he published his Essai sur l'éducation des aveugles. It was printed by the pupils of his school.

The revolution was now approaching and the school was soon in sore need on account of funds. Haüy used up his own little fortune and then tried to eke out an existence by printing hand-bills.

In 1791 the school was united with that for the deaf mutes but this only led to trouble and they were soon afterward separated. Haüy continued at the head of the school for seven years longer but it continued to decline, partly on account of the lack of executive ability on the part of Haüy and partly to his mistake of allowing his pupils to marry, which he permitted from a desire to see them happy. In 1801 the school was united by the government with the Hospice des Quinze-Vingts, an institution for blind beggars. This was more than Haüy could stand so he resigned and kept a private school for five years. He then went to Russia on invitation of the Czar and started a school for the blind. After a few years he left and went to Berlin where he was also instrumental in founding another school but he soon left and returned to Paris where he lived in retirement until his death, in 1822.

For thirteen years after Haüy left Bertrand had charge of the school in Paris. He proved to be both ignorant and inefficient. On his death, in 1814, Dr. Guillié took charge and making some much needed reforms established the school on a better basis. He succeeded in interesting musicians in the school and a number of veritable artists were trained there during his administration. He was, however, unscrupulous and vain, running the school simply to make a show. On account of popular indignation he was compelled to retire in 1821 and Dr. Pignier succeeded him. He developed the art of piano tuning as an employment for the blind. Being of a religious nature he directed the attention of the blind to church music and the organ and with great success. It was estimated that in 1882 there were over 200 blind organists in France. The school was reorganized in 1840 and has been doing excellent service ever since.

The work of Haüy soon bore fruit in other lands. In 1791 an institution was established at Liverpool upon a private foundation to teach blind children trades, to sing in church, and to play the organ.

Dr. Blacklock, the blind poet of Edinburg, became interested in the work of Haüy and translated his Essai. He interested David Miller in the work, who after the death of Blacklock, succeeded in interesting others in the project of founding a school and one was started in 1793. Other institutions were soon established in different towns in England.

Dr. Klein established an institution in Vienna, in 1804, and schools for the blind were soon founded in Berlin, Amsterdam, Prague, Dresden and Copenhagen.

Dr. John D. Fisher while pursuing medical studies in Paris frequently visited the institution for the blind with the idea of starting a similar institution in this country. On his return, in 1826, he succeeded in interesting others in the project and a corporation was soon formed and a little aid was procured from the State. He also succeeded in interesting Dr. Samuel G. Howe in the work and he was induced to become the superintendent of the school. Dr. Howe was sent to Europe to study methods and to procure apparatus and teachers. He returned in 1832, bringing with him two teachers and opened a school in his father's house with six "blind persons from different parts of the State, varying from six to twenty years." His work was successful. Funds were contributed, Col. Perkins gave his house and grounds to the school, and the various legislatures of the New England States were induced to make appropriations for the education of their blind children in this school. Thus originated what is now known as the Perkins Institution and Massachusetts School for the Blind.

Dr. Howe did not restrict his efforts to his own institution for he said: "I am very desirous of seeing ample provision made in every part of my country for the education of the blind and I doubt not that I shall be gratified." He gave addresses in many cities of this country and of Canada. And he and three of his pupils appeared before the legislatures of Ohio, Virginia, South Carolina and Kentucky and so impressed were they that they immediately made some provision for the education of the blind in their respective States.

However, the second institution to be established in point of time was in New York in 1833, Pennsylvania followed in the same year, Ohio in 1837, Virginia in 1838 and Kentucky in

1843. The other States rapidly took up the work so that there are now 36 schools with 393 instructors (137 men and 236 women) and 3,665 pupils (1,898 boys and 1,767 girls). In 1899 there were 107 graduates. The value of the grounds and buildings is $6,334,307, and of the scientific apparatus, $100,610. The current expense is $743,119.[1]

Causes and Statistics of Blindness.

The census returns among other data concerning the blind have given statistics concerning the causes of blindness. But these returns, from the nature of the case, are not sufficiently accurate to furnish valuable results. The cases that have been accurately observed for this purpose are relatively few and have been observed by Magnus in Germany, Trousseau in France, and Oppenheimer in the United States.

In regard to the anatomical seat of blindness, Magnus found in 1,037 cases the lesion to be situated, in the order of frequency, in the optic nerve, uveal tract, conjunctiva, retina and cornea.

In studying the causes of blindness Magnus groups the 2,528 cases of blindness of both eyes that he reports under these heads: congenital, idiopathic diseases of the eye, traumatic, and general diseases. Grouping the cases reported by Trousseau and Oppenheimer in the same way we have:

Observer.	No. of cases	Congenital.	Idiopathic Diseases.	Traumatism.	General Diseases.
Magnus	2,528	3.84%	67.08%	10.76%	18.30%
Trousseau	625	3.04%	57.12%	16.32%	23.52%
Oppenheimer	572	3.84%	48.08%	28.67%	19.41%
	3,725	3.57%	57.43%	18.58%	20.41%

The nationalities show some differences here, thus the United States leads in the number of cases due to traumatism while Germany and France exceed in the number of cases due to idiopathic diseases of the eye.

Congenital blindness is found in 3.57% of all cases. The United States Census gives a much higher figure, 8.46%. The most common conditions found in this group are cataract, syphilis, atrophy of the optic nerve and retinitis pigmentosa. Heredity also seems to play a part here, for cataract, syphilis, various malformations and retinitis pigmentosa appear to be transmitted either directly or transformed. Consanguinity only enters as a cause in combining the hereditary tendencies of the parents.

In 57.43% of all cases, blindness is due to idiopathic diseases of the eye. Of these, ophthalmia neonatorum is the most common. It is an infectious disease and is due to a specific germ micrococus gonococus and is transmitted from the maternal passages to the eyes of the infant at birth. This disease next to atrophy of the optic nerve is the most common cause of blindness. It has been estimated that it occurs in 30% of all cases in the United States. It is, however, amenable to treatment if taken in time, and Glascott has estimated that in nine-tenths of these cases blindness could have been prevented. On account of this, Germany and nine States in this country have made special laws concerning it. In fact, from one hospital in Germany, the Leipzig Lying-in-Hospital, it has practically been eradicated by proper antiseptic measures. The other more common diseases of this group are diseases of the cornea, uveal tract, detachment of the the retina from a high degree of myopia, glaucoma and idiopathic atrophy of the optic nerve.

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[1] For this section the author is much indebted to Prof. Anagnos's Education of the Blind.

Blindness from traumatism is found in 18.58% of all cases. It is especially common in the United States. Oppenheimer found it in 28.67% of his cases, being much greater among the men than among the women. As we would expect this cause figures most prominently in the active period of life but it is also frequently found operative in the first five years of life, the child most often receiving injury to his eyes from playthings. Cocius found the trades in which injuries to the eyes were most common to be (except miners) locksmiths, handscraftsmen, masons, smiths, and machinists. The eyes could be protected by spectacles or suitable guards but the men are averse to wearing them. It is estimated that one-half of the persons who lose one eye also lose the other one from sympathetic inflammation.

General diseases of the body caused blindness in 20.41% of the cases. Here disease of the brain, spinal cord and membranes are the most common of the organic diseases. However, the acute infectious diseases were found by Magnus to be the cause of blindness in 24.8% of his cases. The chief of these were small pox (12.10%), typhoid fever (5.18%), measles (3.46%), and scarlet fever (2.81%). Syphilis, although causing many eye affections, rarely causes blindness. Various poisons as alcohol, tobacco, lead and mercury, also figure sometimes as the cause of blindness.

Occupation has an influence on eye diseases, particularly those occupations in which the work is held close to the eyes and are thus conducive to myopia. While myopia, in the great majority of cases, is stationary, yet in a few cases it is progressive and may end in blindness from detachment of the retina. A large number, although not totally blind, yet are incapable of work.

A number of studies have been made concerning the prevention of blindness. Cohn concluded that one-third of all cases were avoidable. Durr and Steffer and Rössler came to the conclusion that 40% of the cases that they studied were avoidable. Dr. Hays, making a summary of the data on this subject, found that 27.89% were unavoidable, 38.75% were possibly avoidable and 33.35% were certainly avoidable. Regarding one-third of the cases in which avoidability was uncertain as avoidable, and this he thinks is a conservative estimate, he finds that blindness could have been prevented in 46.27% of the cases. Cohn, from a study of the record of 70,174 cases of the Wiesbaden clinic, in 1887, concluded that 39.22% were avoidable.

From a consideration of these figures and the progress of medicine in recent years which has given us antiseptics and the control in a great measure of the ravages of the infectious diseases, of which we might instance small pox, we would expect to find blindness decreasing. And such is the case. In 1880 there were in the United States 976 blind to the million population, in 1890 there were only 880. In England the number has decreased from 1,021 to the million in 1851, to 809 in 1891. Scotland and Ireland show a similar decrease, as also Prussia, Saxony, Holland, Austria and Italy. This decrease is explained as directly due to better treatment of ophthalmia, diminution of small pox and better protection in shops and factories. There are some trades probably in which the number has increased as glass blowers and iron puddlers.

The greater part of the diseases and conditions which we have noted as causes of blindness are of peripheral origin as cataract, syphilis, atrophy of the optic nerve, diseases of the cornea and uveal tract, traumatism, etc. However, there are a number which arise from central conditions or are indicative of some disturbance there as malformations, retinitis pigmentosa, atrophy of the optic nerve, and diseases of the meninges, brain and cord. Where this latter group occurs there is great probability of mental defect. In fact we find the percentage of mental defect much greater among the blind than the seeing. Of 130 pupils registered in one of the schools, 11 or 8.4% were thought to be non-self-supporting even with sight and "as many more might be put in the doubtful list." Counting one-half of these as certain this would give us nearly 13% as mentally defective. This is shown to be near the truth since the history of our institutions shows that 90% of the pupils may be rendered self-supporting. So probably 10% could be regarded as a fair estimate of mental deficiency among the blind. Among the general population the ratio is only 0.2%.[1]

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[1] 32nd Report of the N. Y. State School for the Blind.

In 1876 Geo. Meyer estimated that there were 180,537 blind persons in the world, or one to 1,154 inhabitants. The number of blind in census reports is generally underestimated. After a careful examination of three counties in Scotland it was estimated that the census returns were 15.5% too low. The number of blind in a country varies according to occupation, climate and other conditions. The number of blind per million of inhabitants is as follows:—

Holland (1889),	445	Germany,	870
Canada,	669	France (1883),	947
Scotland (1891),	698	Spain (1860),	1,109
Italy (1881),	761	Russia,	about 2,000
United States (1890),	808	Portugal,	2,190
England and Wales,	809	Finland,	2,226
Sweden (1880),	816	Iceland,	3,400

Thus the United States stands below the average. In 1890 there were in the United States 50,568 persons blind in both eyes. Of these, 7,217 were colored or 945 per million, the proportion being greater among the colored race. The proportion is also higher among the foreign born, being 992 per million.

The proportion of blindness varies according to age. If a curve is plotted it is found that it rises rapidly to twenty, is level between twenty and thirty, then rises slowly to forty-five and then rapidly to seventy-five.

Of the 50,568 blind in the United States, 4,267 or 8.4% were congenital cases. And although the proportion of blind steadily increases with age yet the ratio of congenital blind remains constant to sixty-five years.

The number of blind within the school age, or between five and twenty years, was 5,708 and of these 1,105 or 19.36% were in school.[1]

Climate seems to stand in some relation with the causes of blindness. This fact led Zeune to formulate the law that the proportion of blind gradually increases as we go from the high latitudes to the equator. The law contains a general truth but there are many exceptions. Coast regions have a larger proportion of blind than the high inland regions. But probably the hygenic and social conditions are determining features here. Zeune's law holds for the north, middle and southern thirds of the United States, but there is also a decrease in the proportion of blind as we go West. The States showing the greatest proportion are widely distributed and are New Mexico, Vermont, Kentucky, Virginia, Tennessee, Arkansas and Maine.

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[1] Hence the passage of a compulsory education law has been urged in several States.

The Census Report says that these differences "are in part due to differences in the proportion of persons of advanced age in the population, in part to pernicious epidemics of eruptive fevers in certain localities and in part, perhaps, to heredity in certain families."

The blind, contrary to the rest of the population, show no tendency to congregate in cities.

According to Magnus, the period of life in which there is the greatest danger of loss of vision is from one to five years; next comes the period from fifty to sixty years. In the period from five to twenty years the danger is smallest, but it gradually increases from twenty to fifty years. Traumatism enters largely as a cause in the first period and during adult life.

Blindness is more common among men than among women, thus one among every 1,142 men is blind and one among every 1,359 women. Of the congenital blind the proportion of men to women is 550 to 450. Thus the proportion of blind among women is below the average of the world.[1]

PSYCHOLOGY OF THE BLIND.

"Blindness is an incurable total loss of sight." Thus it has been defined but practically all are blind whose vision is so poor that they cannot work at occupations requiring the use of eyes.

The eyes of the normal child are sensitive to light on the first day. But blindness, probably, cannot be recognized earlier than the third or fourth day. The presence of vision is best shown by reflex to light stimulation. This can be tested by flashing light in the eyes but a better test is to call out the reflex by thrusting the hand toward the eyes. The diagnosis is not made sure, however, until the child fails to recognize the mother. The blind child comes to recognize the mother slowly and by the voice. And as mothers are always the last to recognize defect in their own children they frequently wait weeks for this recognition.

As the blind child grows, the physical defects are soon doubled and the moral effects are as profound although less apparent.

The effect of the loss of visual sensations is very great. More sensations are received from the eye than from any other sense organ. The mind of the young child is a veritable *tabula rasa*. Hence the vacuity of mind that the blind child instinctively feels and his longing for something. This results in his becoming miserable if he is not rightly understood. There is a mental hunger for sensations as real and as important as physical hunger. And of the two, mental starvation is the most deleterious. This sensation hunger leads them to adopt various substitutes. They press, rub, and bore in. their eyes with their fists which some think a sort of vicarious sight. Some of them with a little light sense move their hands in front of their eyes or look at the sun. They are also prone to rocking motions which are hard to break up. On account of this vacuity of mind Netlicher advises giving the blind much music in order to keep the mind from degenerating.

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[1] For this section the author is much indebted to the article by Dr. Hays in Norris & Oliver's System of Diseases of the Eye.

Jastrow has collected 114 cases of blind persons of various degrees of talent of whom the ages at which they became blind could be determined. Of these, 11 were very distinguished and 10 of them became blind in advanced youth or later life. There were 25 in the group next in eminence and they became blind at nine or ten years (musicians being the earlier). The remainder acquired blindness at about seven years of age. The musicians, however, became blind on an average at three years. "All this," he says, "speaks strongly for the permanent intellectual importance of sight in early education."[1]

The importance of vision for cerebral and mental growth is also shown by the fact that blindness produces atrophy in the corresponding cortical centers. Investigation on instincts have also shown that certain sensations are necessary at the proper time in order that the particular modes of behavior should become fixed and permanent.

The absence of visual sensations makes the perceptions of the blind very different from the seeing. They do not attach the same idea to different words that we do. This the teacher of the blind must continually keep in mind and in a way become a pupil of his charge. The idea that a seeing person has of a room is usually composed of a series of mental pictures, that of the blind man must come from the senses of touch, muscle and hearing and is composed of the distances he can walk, the way his voice sounds and the echoes that it awakes and possibly the touches that he may receive. For the blind "a soft sonorous voice is the symbol of beauty." Blacklock, the blind English poet, associated "some moral quality with visible objects" and probably all congenital blind are like him in this respect.

Lenôtre, the blind man of Puisseau, thought the eye to be an organ upon which the air produced the same effect as the staff on the hand. For him a "mirror was a machine by which objects were placed in relief out of themselves."

Aside from curiosity probably few blind would wish for sight on account of the revolution in their mental life that it would involve. They would have to learn their world over again. For us it would be the same as acquiring a sense for the X-ray.

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[1] Fact and Fable in Psychology, pp. 316, 331.

The opinion of Lenôtre on this subject has already been quoted.

Indirectly the loss of sight results in great immobility. The blind child has no one to encourage him to move, so he sits in his corner, rocking in his chair, possibly throwing his arms about and jumping and crying. He walks little and often reaches the age of seven without running. This lack of movement produces bad physical effects. Nutrition is slack. He is anæmic, lean, and his muscles are flabby. Their joints are flexible so that the hand can be bent back to touch the fore-arm. This is one reason, so Netlicher thinks, that they become beggars. But the greatest loss to the blind from their lack of movements is the loss of sensation. We realize this when we compare them with the normal child and his continued movements and sensation hunting. This leads to much delay in their mental growth.

The age at which the child becomes blind has, as we have seen, an influence on his mental growth. The condition of the child becoming blind previous to the age of five or six approximates that of the child born blind.

Jastrow personally examined two hundred blind persons making inquiry, among other things, as to the kind and nature of their dreams. In 58 of these cases the blindness was total. Of these, 32 became blind before the end of the fifth year and not one of these had dreams of seeing. Six became blind between the fifth and seventh year and four of these saw more or less vaguely in dreams. Twenty became blind after the seventh year and "all have dream-vision." So he says, "the period from five to seven years is indicated as the critical one." The visual center needs the sensations for its development and if deprived of them "degenerates and decays." But if blindness accrues after seven years the center can maintain its function.[1]

Dr. G. Hurmann, in 1838, made a similar series of observations. Of 14 totally blind persons who lost their vision before the fifth year, none had dream vision. Four lost their vision between the fifth and seventh year and only one of them had definite dream-vision. And 35 lost their sight after seven years and all had dream-vision. He also found that those who became blind later in life retain this power longer than those who lost their sight near the period of the fifth to the seventh year, although he found two cases in which the power was retained until the 52d and 54th year before it faded out.

Jastrow's cases of partial blindness point to the same time as the critical period. This has also been found to be the critical period for mutes. He likewise found that the earliest remembered event among 100 blind persons gave an average age of 5.2 years.[2]

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[1] Jastrow: Fact and Fable in Psychology, p. 342.

[2] Fact and Fable in Psychology, p. 345.

The senses of the blind are commonly thought to be much sharper than those of seeing people. And many stories are told to prove the point. Saunderson could distinguish by touch the true from the false among a number of metal pieces. We are also told of a butcher of Bologna who could tell by touch the weight of an animal that he was going to kill. He knew "weights and moneys" and did all of the business of a butcher. But those that come in contact with the blind are convinced that their senses are no more acute than those of seeing people and that there are as great individual differences. Their condition compels them to observe differences that are neglected by seeing people, hence, their so called sense acuteness is more a matter of apperception.

Prof. Griesbach, of Basile, made some experiments upon the senses of the blind. His "observations were made upon those otherwise healthy. In the power to receive impressions by touch, no remarkable difference was noticed between the seeing and the blind; or if small differences did exist they were in favor of the seeing. In those born blind, the tactile sharpness was somewhat less than in the seeing, and in some cases the sensorium generally was equally defective. In the capability of localizing impressions by sound, no difference existed between the blind and the seeing, nor in the acuteness of hearing. In both, great individual variations occur. No difference was observed between the two classes in regard to the acuteness of smell. In the execution of manual labor the blind became fatigued sooner than did those of equal age who could see. The blind were much more fatigued with manual labor than with mental work, which was not the case with those who could see. Both among the blind and the seeing there were persons who had many, others who had only a few, and others again who had no illusory or erroneous impression of touch."

Hocheisen experimented on the touch of seven blind and two seeing persons with the compass points. The places tested were the back and palm side of the phalanges, palm and back of the hand, and palm and back side of the wrist. From an average of fifty tests he concluded that the sense of touch was no finer among the blind than among the seeing and that the objective acuteness of the trained blind is due to psychical causes, who, by attention, notice neglectible differences.

Lucy P. Brownell repeated the experiments of Hocheisen on four blind and four seeing persons. She found much individual variation, and that the right hand did not correspond with the left, and that the index finger is usually the most sensitive. She finds no greater fineness of touch among the blind than the seeing. She finds that reading does not make the finger more sensitive. Movement is a very important factor in reading and without it the blind are practically unable to read, hence, reading would not increase the fineness of discrimination of the compass points.

The phenomena of "face perception" in which they seem to see by the skin is really their ability to appreciate delicate sensations of touch and heat. But it is usually only the presence of very near objects that they can tell in this way. Saunderson when assisting in making some astronomical observations was able to tell when a cloud passed between him and the sun. And Lenôtre du Puisseau could estimate the distance of fire by the degrees of heat and the nearness of large bodies "by the action of the air on his face."

Touch and hearing are the substitution senses of the blind. The ear performs many of the functions for the blind that the eye does for the seeing. Like the eye, it gives knowledge of things at a distance. It gives them some sensation of space, for one of them says "When I am in a vast plain it seems to me that I have lost my hearing." By it they can recognize the age and size of persons and judge of their temper. By it they can judge of the size of the room that they are in or whether they are in a street or alley. By it they recognize the position of persons and of furniture in a room and tell whether the latter has been disarranged or not. The ear is the chief guide in walking and by the echo they tell whether they are walking beside a fence or not and of the height of the fence if it is not greater than their stature. They can also tell the material of which the fence is made, whether of wood, iron, or stone, and of the way it is built, as picket, matched boards, or gas pipe. By the echo they tell the position of trees, posts and obstructions. The echo also enables them to walk straight and to tell the positions of gates and doors. Anything that interferes with this echo, as snow, loud noises, or rubbers on their feet disturbs them very much and renders walking more or less difficult or impossible. In walking the touch of the feet also helps them to walk straight and tells them of the kind of walk, as flagstone, brick, concrete, asphalt or earth, and also of its slopes or depressions.

The blind have a reputation for having a good memory. What they do know they know more tenaciously. Eye knowledge is more illusionary and more easily corrected than other sense knowledge, hence, the latter is more stable and fixed. They acquire more easily from hearing than seeing people. Du Puisseau could recognize the voice of a person that he had heard only once. And, as we have seen, the annals of the empire were kept by the memories of the blind of Japan.

The emotional life of the blind is limited. They are spoiled by tenderness and become vicious. A sense of imperfection broods over them, and those that are with them should aim more at making them feel satisfied than satisfying them. The ennui of life is increased but does not lead to suicide. They are timid, and modesty to them is imaginary. Disputes among them are rare.

They are individualistic and have a taste for independence and liberty and are lacking in friendly and social emotions. Since their knowledge of the emotions of their fellows only comes to them through the ear, they lose much of it and hence lack in sensibility. We learn by seeing, but they get it only by inflection. "A soft sonorous voice is to them the symbol of beauty." The uplifting power of nature and the beauty of the earth, sea and sky is to them unknown.

They are given much to reflection which is concentrated upon themselves, hence, self-love is their most prominent defect. They are as self-conscious in public speaking as the seeing. They dislike to be helped and thought incapable of getting around. They are easily led to become suspicious and pity has a bad effect upon them.

The sex impulse manifests itself at puberty. And flirting is noticed among them as well as among the seeing. Self-abuse is thought to be quite common among them. But this may be due to the fact that they are more easily detected in it. However, their sensation hunger and the tendency to stimulate other senses for those wanting would impel them towards it more than the seeing. Hence, all authorities seem to agree that the boys and girls should be educated separately.

The blind are given to reflection and have great facility for analyzing and synthesizing ideas. They are not so easily deceived by the appearance of things and their judgment is truer. They have a great desire for knowledge and unusual powers of imagination.

The ideas of the blind are different from those of seeing persons yet they must use the same language with the result that it is poor and difficult. Some poets have been blind but it usually came on them late in life. The English poet Blacklock, however, lost his sight in infancy. It is said that his "productions are marked by elegance of diction, ardor of sentiment and accurate description of visible objects" but "his works will be searched in vain for poetry of a very high order." He always "associated some moral quality with visible objects." Some blind people use language with the precision of the seeing. This, it is thought, is to be explained on the basis of something analogous to colored hearing.

In regard to the will of the blind it is to be noted that the will has less control over the ears than the eyes. In later life they are strong willed and positive. They stick very tenaciously to a trustful person. Subjecting them to pity and making them suspicious by watching is very bad on their morals. They should be made trustful and helpful. Conscience is not as influential with them as with the seeing. They are very religious. Their sense of helplessness, which is regarded as one of the roots of religion, is supposed to account for this. However, their defect renders them incapable of fully appreciating religious services.

Pedagogy of the Blind.

The strong sympathy or pity aroused in the minds of mother and relatives by the condition of the blind child leads to excessive care on their part much to the detriment of the child. They care for him, wash and dress him, anticipate his wants, in fact do everything for him, and permit him to do nothing for himself, thus rendering him incapable of doing anything. Or the mother with the many duties of a large family may not be able to give him the attention that he demands. In either case the child remains inactive, sitting in his rocking chair in the corner amusing himself with whatever sensations that he may be able to excite, being fearful of movement since he is continually cautioned or receives no proper encouragement. Hence he becomes pale and anæmic with awkward and inco-ordinated movements and flabby muscles, and so incapable of properly appreciating the few sensations that he does receive. The education of the seeing child begins at birth, but too often that of the blind child can only be said to properly begin with his school life.

The blind child should walk as soon as the seeing child. But in order to do this he needs much more training. They should be left to walk by themselves, and should be given exercises in walking up and down stairs. Netlicher thinks that they should early be taught to use their left hand as a feeler, and so walk with the left shoulder first. This will also aid them by getting the wind in their face. They are more liable to walk in a circle than a seeing person who is blindfold, this is thought to be due to the fact that they can see more with one eye than with the other, and that one side is better developed than the other. They should, also, be practiced in walking where there are obstacles, and taught to walk planks and spring ditches in order to give them confidence.

Much attention should early be given to the toilet. They should be taught to dress themselves. It is difficult for a blind child to tell when his face is dirty or whether their clothes are in a neat condition. They must be taught to comb the hair and to keep the finger nails clean. It is difficult for them to use a spoon and to tell when it is right side up, so they have to be taught. Much training is necessary in order that they may know that it spatters when placed in the soup.

Much attention must also be early given to teach them correct postures and attitudes. Since they cannot see they are given to stooping and making faces and grimaces. They rub and bore in their eyes. They are very prone to rocking and automatic motions. These are very hard to check, and tying the hands is sometimes necessary. They also have a tendency to tap everything and to hold their mouth open in order to hear better.

The prestige of convention is lacking with them. They are ignorant of decorum and social decencies that the seeing child acquires almost without knowing it. They do not know that it is proper to turn the face toward the one speaking and not to gap and sneeze, etc. They must be taught how to stand in dressing so as not to expose the body.

Since the blind have to spend their lives among the seeing, to all outward appearances they should be taught to be as much like them as possible and so become as agreeable as possible. They have no consciousness that their habits are bad or their attitudes disagreeable. The blind are always noticed by strangers and subjected to more scrutiny than seeing people, so it is a kindness to them to correct unsightly habits, and the earlier this is begun the more successful it will be.

The education of the seeing child begins at birth, and play is the greatest educational factor of his early years. The blind child must be early taught to play, both for its physical and mental as well as moral effect. However, great care should be exercised in this to develop proper initiative on the part of the child. He should be bounteously supplied with toys, especially those which are models of the things of real life, such as houses, horses, wagons, soldiers, fire engines, animals, etc. He should be taught all the games of seeing children and be urged to do all that seeing children do.

The age at which the children are received into the schools for the blind varies in the different States from six to nine years. But the "observation of the disastrous mental, moral and physical effects of neglect and ill usage upon blind children before reaching the school age" has led some schools (private) to receive them much earlier, in one place as early as three years. The results of this are that the State is saved hundreds of dollars, for it is well established that the "nervous and shattered physical condition of some of these neglected waifs retard their progress in the kindergarten and primary department for a long period." But if a little attention were given to making the childhood experience of the blind as full and complete as possible this action on the part of the special schools would be unnecessary. In fact all seem agreed that the association of the blind with the seeing child should go as far as the second or third year of school life, even if no special attempts are made to teach them to read. Indeed such action on the part of the child will save him one or two years in the special school.

The kindergarten is a most effective institution in the training of defectives. On account of the poor condition in which the blind children are brought to the schools, some think that all of them should be given the kindergarten training until nine years of age. It is the most effective means for reaching and developing them. It arouses them, wakes them up and puts them in touch with their surroundings. The mat weaving, card sewing, clay modeling, paper folding and games make the blind child more alert, sharpen his perceptive faculties, give him better use of his hands and make him more considerate of others. For training the hand as hand also trains the brain. In fact this training gives them an impetus which is felt through the remainder of their school life.

The kindergarten work in the best schools for the blind is the same as in the schools for seeing children, not even the color work is omitted, for some of the children can see a little, and those who cannot delight to talk about it.

The sensation starvation to which the blind in a greater or less extent are subject makes special sense training a necessity for them. Other senses must be substituted for vision, these are hearing and especially active touch. Their fingers have to be ten eyes for them. They must be taught what birds, insects and the various forms of animal life are. They have, also, to be taught to distinguish metals and coins. Models are necessary to teach them the form of houses, churches, hills, valleys, railroad trains, steamboats and all objects that are too bulky or otherwise incapable of being handled by active touch. The teaching and demonstration work, which among the seeing appeals to the vision, must be made to appeal to the touch of the blind, hence the need of tangible apparatus for science and of relief maps for geography. Again, people assume lack of knowledge of things not touched, so things must be placed in terms of touch as seeds, metal, glass, fruit, insects, etc. And such work should be arranged so as to lead to motor response. The blind, like all others, learn best by doing, hence the introduction of manual training and especially of Sloyd which seems especially adapted to them. The knowledge of the use and manipulation of tools is useful not only for motor training but as leading up to the trades which some of them must follow in after life.

Physical culture is much needed by the blind to develop and give them control of their weak and flabby muscles. Besides the direct physical advantages gained it gives them "confidence of bearing and grace of carriage, sharpened mental faculties, greater self-control and reliance," and helps them to overcome the timidity which is aroused in them by their being continually warned of danger.

All forms of active games have a place here as skating, dancing, bicycle riding, etc., as well as the more systematic gymnasium work.

The sense of smell, which is comparatively little used by the seeing, is capable of giving much information, and among the blind it should be trained by full courses.

Hearing is the educational sense of the blind. From it they get their greatest profit and enjoyment. The methods of reading and writing for the blind are at best cumbersome and but little comparatively is written in them. So they have to place great dependence on their ears. The power of attention through the hearing should be cultivated to quick perception and strong retention. To this end oral instruction, conversations, readings and addresses are useful, as also the musical training.

The curriculum of the schools for the blind is the same as that for seeing children in the grades and the high school, for all of the schools aim to complete the high school course. And the work differs only in that much more attention must be given to sense perception work, especially to the cultivation of touch and hearing.

In the high school the usual amount of attention is given to literature, history, rhetoric and mathematics. Blindness acts as a serious obstacle only in the science work, which, of course, they are unable in great part to pursue according to the usual laboratory methods. Hence the amount of science work varies a good deal. Physics is taught in all of the schools. The other sciences are also taught, and they are, in the order of frequency, geology, chemistry, physical geography, zöology botany and astronomy, while psychology and mineralogy are mentioned. Latin and one of the modern languages are offered by most of the schools although all of the scholastic languages are offered by some schools. One school offers ethics and philosophy. Typewriting is taught in all of the schools at present, and offers a most convenient method of communication with their seeing brethren. Some have been able to use it as a means of support.

There has been a movement to establish a national college for the blind similar to the Gallaudet College for the deaf at Washington. But the movement has been abandoned for it is thought that these ends could be best attained by giving scholarships at the colleges already established. It is felt by those interested, that the establishment of a separate college for the blind would tend to mark them off as a separate class, which is now considered undesirable.

The special problem that arises for solution in the instruction of the blind is the devising of means for teaching them to read and write which shall be both practical and efficient. We have already mentioned the early attempts at the solution of this problem and finally the invention of embossed printing by Haüy. He made use of the Illyrian or Sclavonian alphabet, the same that St. Jerome had used in the Vulgate. Large editions of a few books were printed which created great enthusiasm among the seeing but were not well adapted for the blind for they were eventually sold for waste paper. Later, however, this type was improved by being made smaller and of a more open and perfect form which made them more easily distinguishable.

James Gall, a publisher of Edinburgh, saw one of these French books and became greatly interested in it for here he saw a means of giving the Bible to the blind. He procured some of the French types, but soon saw that their defect lay in their lack of legibility to the touch, so he set about improving them. He concluded that the capitals were too symmetrical and uniform to be distinguished by touch, so he adopted the common lower case type. These he changed by making them larger and more open and angular. This has since been known as the triangular system, and was printed in high relief and was easily read.

An ingenious attempt was made at the Glasgow asylum to form an alphabet of knots in a string. And books composed of balls of string were formed after this method. But needless to say it soon fell into disuse.

A prize of twenty pounds, offered by the Scottish Society of Arts, in 1827, for the best alphabet for the blind, called out the Alston alphabet. It was composed of boldfaced Roman capitals. This was the alphabet that was introduced into the Pennsylvania Institution by Friedlander.

The next system in the field was the stenographic devised by Lucas, of the Bristol Institution, in 1837. The letters were formed of curves, strokes and circles similar to those of the Pitman phonography. It was adopted by several schools in England, but was found to be difficult.

About the same time Frere invented the phonetic system in which the sounds of the language were represented by stenographic looking signs. This system was easily learned, especially by old people, but was said to be hard on their pronunciation. It was only adopted by one school.

The Moon system is composed of nine characters formed of arbitrary lines; these are arranged in different positions so as to give some resemblance to the Roman letters. It makes use of " return lines," but does not reverse the letters. The letters are large and easy to read by touch. A boy that had been unable to learn the other systems after five years work learned this one in ten days. However, the books in this type are large and costly. It is said to require sixty volumes folio to print the Bible in this type. It is easily learned by persons who lose their vision late in life, and since the majority of the blind are over fifty years of age the system is still quite popular. Over 195,000 volumes have been printed in this type, and in 420 languages and dialects. There are two printing houses which use this type, one in London and the other in Philadelphia.

Soon after the Massachusetts school was established Dr. Howe gave his attention to devising a system that would be easily tangible but at the same time easily read by sight. The result was the so-called Boston line type. He used the lower case Roman type, but made the letters more open and angular. It received the first prize at the London Exhibition of 1852. Backed by this endorsement, and the authority and energy of its author, it soon became the predominant system in this country, even the Pennsylvania Institution adopting it.

The attempts so far have made use of lines, and most of them have tried to approximate the Roman type. For it was thought that by making use of an artificial alphabet the tendency would be to make the blind a class apart from their seeing brethren. But the difficulties of the line systems directed the search for a type for the blind in another direction. It was soon found that a series of points can be much more easily perceived by them than a system of lines. So point alphabets for the blind stand on a more scientific basis than the line alphabets.

The first attempt in this direction was made in 1825 by Chas. Barbier, of Paris. Five years later this system was taken up and perfected by Louis Braille, of the Paris school, and it has gone by his name ever since. The basis of the system consists of a cell of six points arranged in two vertical rows. The omission of one or more of these points give the signs for the various letters, figures, punctuation points and mathematical signs. Also it includes a complete musical notation.

Besides its legibility, Braille has another important feature which the line types do not have, and that is it can be written by the blind. This is done upon a writing board provided with a guide by puncturing the paper with a stylus, but it must be written in the reverse order, so that the blind have to learn two alphabets, one for writing and the other for reading.[1]

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[1] M. Dussaud has recently invented a writing tablet in which the

This system was very slow in being adopted, for although it was used by individuals yet the Paris school did not adopt it until 1854. But it finally came to be used in the schools of France, Switzerland, Belgium, Holland and Rio Janeiro. Braille was introduced into England in 1853 by Johnson in a book entitled "Tangible Typography," but in 1868 it was little known. When adapted to English it became cumbersome and wasteful for it did not make use of the principle of recurrence, that is that the letters most used should be represented by the fewest points. It had antiquated contractions and abbreviations and allowed of "bad use" like the omission of capitals, etc.

As we have seen the line type became predominant in the schools of this country. But eventually it became apparent that many of the blind could not learn it. In 1868 Wm. B. Wait, of the New York school, found that after two years instruction 32% of his pupils could not read, and in one large school 58% of the pupils were non-readers although some of them were the brighest pupils in the school. In all he collected statistics of 664 pupils in his own and in other schools and came to the conclusion that only 34% of them learned to read the line type with "pleasure and profit." So he set about to devise a new system. He determined that writing for the blind should respond to the following tests. It should be tangible, it should be capable of being written, it should be adapted to mathematics and music and the characters should be equivalent to and correspond with the seeing characters for which they are a substitute. Line type fails in tests one and two for it is not tangible nor capable of being written. Line is deficient in variety and intensity for touch. Change is necessary for perception by touch, hence points are more tangible than lines. So he made as the basis of his system six points arranged in two horizontal lines. He preferred the horizontal arrangement because it made fruitful the principle of recurrence, it is more capable of abbreviation and also expansion and also offers the basis for the formation of a system of shorthand. From tests on his pupils he concluded that all blind persons could learn this system, for the 32% of his pupils that were unable to learn the line print after two years of instruction learned his system after eleven hours work. This is the so-called New York point system. At the next convention of the instructors of the blind it was resolved that New York point should be taught in all the schools. A national printing house was shortly afterward es-

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impression is made upward, thus enabling the child to read what is written and obviating the use of two alphabets. See "Appareils pour les Aveugles." Comptes Rendus de l'Acad. des Sciences. 10 Feb., 1902, p. 375.

tablished at Louisville, Ky., for furnishing books in this type. In 1893 it is said that most of the schools preferred this to line print.

This invention follows embossed printing as the next great advance in the methods of instruction of the blind. Its chief advantages of tangibility, and that it could be written, were of great importance to the blind for it placed them more on the basis of seeing pupils. It made them more self-dependent, and by being able to read and write they were thus enabled to rely less on oral instruction.

In 1892 Mr. Smith, of the Perkins Institute, promulgated a modified form of Braille known as American Braille. He attempted to combine the best features of New York point with the Braille system. He eliminated the defects of old Braille and adopted the principle of recurrence. Its points of excellence are said to be that it is best in point of space, is less laborious to write, is easier to comprehend and more elastic. And it is claimed that it is superior to New York point in that it does not waste linear space, has a better system of punctuation and does not permit of such long and undesirable characters.

Shortly after this system was promulgated a typewriter for writing Braille was invented, and a little later a stereotype maker for embossing metal plates. With this latter machine and a few appliances each school can have a printing office of its own. These two inventions greatly increased the spread of American Braille. So that now the contest for supremacy lies between it and New York point. This, although a seeming wasteful process, must be beneficial in the end in selecting the best system.

However, the line type still has its advocates who favor it for reading although the point must be used for writing. It is claimed that the pupils themselves favor it when properly taught. For they claim that they can read it better, that it is less fatiguing, that it does not irritate the fingers like the point, that they can understand the punctuation better, and that on the whole it is more pleasing for the seeing can see what they are doing. The advocates of line point out the process of learning is not so different after all, that the point print is much more easily injured and disturbed. And they claim that any system like point must be defective that depends on position, reversion and substitution.

Large and well selected libraries exist in all systems which are being continually increased. One school has a library of 13,000 titles, over 7,000 of which are in American Braille.[1]

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[1] In 1882 the Boston Public Library established a circulating library for the blind. Thirteen years later one was established in New York,

There are two systems of music notation in use, the New York point and the Braille. The same contest for supremacy exists between these two systems. The tendency seems to be toward the Braille since it seems to be more complete and more easily handled than the New York point. The Braille is the same the world over, and it has the advantage of a larger amount of printed music.

As we have seen, the blind mathematician Saunderson, was probably the first one to invent a cyphering tablet. Many have since been invented, but that by Taylor is probably the best. It consists of a board in which are columns of octagonal holes. Square pins fit in these holes, thus giving eight positions and when reversed eight more. On one end of the pin is a raised edge, on the other this edge is divided by a notch. The sixteen positions afforded can thus give signs for the digits and the algebraical signs.

Thirty-nine States and Territories have established schools for the education of all those persons of school age who cannot profitably attend the public schools on account of defective vision. In addition to educating them the schools propose to render their pupils capable of self-support.

Music occupies a large place as a culture study in all schools for the blind. And it is taught to all pupils that show any aptitude for it. Many of the blind have adopted it as a profession, and in it they have probably won their greatest renown. Some have become teachers, while probably more have earned a livelihood by playing the church organ. But it is probably in piano tuning that the blind are best able to compete with their seeing brethren. It is a trade that demands high mental training, but not such great mechanical ability. It is taught in many of the schools, but it is found that only a small per cent. have the ability to become professional tuners. To succeed here as elsewhere the blind must be better trained than their seeing competitors.

Various trades are taught at all of the schools. The most common of these are broom making, cane seating, mattress making and upholstering. The girls are taught to sew, knit and crochet. Other have been introduced at various times but have been dropped. "Most of the institutions for the blind in America," says Mr. Anagnos, "have tried the experiment of introducing one trade after another with the view of securing gainful employment for their graduates and apprentices, but without avail. Such industries as seemed to give promise

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Philadelphia soon followed, and a reading room for the blind was provided when the new Congressional Library building was occupied. There are now eight other cities that provide circulating libraries.

of fair profit have in turn been taken up only to be dropped after a few years experience as inadequate and unprofitable. Thus every attempt to utilize various mechanical arts and render them reliable sources of income has failed.'' This is due to the difficulty that the blind mechanic has of competing with the seeing one and to the difficulty of marketing his product. It is very often as a business man and not as a mechanic that he fails. Again, the use of machinery has thrown him out of the trades in which he formerly found employment. Then the course at school is too short to teach a trade with the best results, and they do not attain the skill that they would if apprenticed. It is often the case that the pupil is only becoming skilled when he has to leave school. The value of a trade to the blind depends on the business conditions of the community and of course varies from place to place. Brush making, which was formerly taught, is no longer profitable, and cane seating is no longer much in demand. Broom making still remains the trade most suited to the blind, and is taught in nearly all of the schools. It is easily learned, and hence is suited to those dull mentally, the ones that have to depend on their hands for support. Yet even here it is found that although all can size the corn yet only 90% can learn to sew and only 50% to wind properly. And to be able to succeed here the product of the blind man's work must be able to compete successfully with that of the seeing. So it is not as hand workers but as brain workers that the blind succeed best as the history plainly shows.

We are told that the words masseur and blind are synonyms in Japanese, and indeed it would seem that it is a profession particularly adapted to them. Massage has recently been introduced as a professional study in the school for the blind at St. Petersburg, and its promoters are very enthusiastic concerning it. The instruction includes anatomy, physiology and technique. Skeletons and manikins marked in Braille and wet specimens are used in instruction, and also a rubber manikin for practice. The course includes a period of actual practice in hospital work before the pupils are sent out for private practice.

However, there is no employment or profession in which the blind are not found. According to the 11th census the employments in which the blind were most numerous are in the order of frequency, farmers, laborers, carpenters, merchants, mechanics, teachers, miners, clergymen, peddlers, physicians, shoemakers, tailors, and some were even artists, photographers, engravers and painters.[1]

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[1] There are nine working and industrial homes for the blind in the United States. These are situated at Oakland, Cal., Knoxville, Iowa,

How many of the blind do succeed in supporting themselves after leaving school is difficult to determine for many are lost sight of, especially the girls. The New York State School claims that 90% of their pupils are self-supporting. Truly a high percentage when we consider the proportion of mental deficiency among them. In 1878 a census of the graduates of all the schools was taken, it showed that: "16 became superintendents of other institutions; 214 became teachers or were otherwise employed in institutions; 34 became ministers of the gospel; 84 authors, publishers or lecturers; 310 were engaged as teachers of music or were vocalists outside of institutions; 60 had been organists in churches; 125 piano tuners; 937 had been engaged as teachers, employees and workers in handicraft; 277 were storekeepers, etc.; 45 became owners and managers of real estate; 760 (mostly women) were employed at housework at home or in families, or at sewing machines, or by hand, and 78 were in homes of employment."

In 1880 of the 48,928 blind persons in the United States 2,560 were in almshouses, but here "it must be remembered that blindness is an affliction of old age."

According to the report of the New York institution for 1879, "More than 1,200 persons have been instructed, and have gone out from the institutions for the blind in this State, only 21 of whom were found to be in almshouses on the 30th of October, 1879." Such facts give great force to a statement made by the board of State commissioners of public charities upon this subject. They say: "As observation shows that educated blind persons seldom become a public charge, it would seem important, not only in its social bearings, but as a question of political economy, to bring as many of the blind as practicable under proper educational training." To meet this condition many of the schools favor a law enforcing compulsory education of the blind.

Psychology during the past twenty-five years has had much to learn from pathology and pedagogy would no doubt gain as much from a study of the methods of instructing defectives. And, indeed, the influence has been shown in one of the great classics. Rousseau lived near the school where Pereira was teaching the deaf to speak, and was often an interested visitor at the school. As a result "the book of Emile is full of experiment upon physiological teaching which could only have originated in the school for deaf mutes; so identical are the theories of the book with the practice of Pereira."[1]

Louisville, Ky., St. Louis, Mo., New York City, Iberia, Ohio, and three in Philadelphia, Pa. In 1892 these had a population of 266, and their sales amounted to $91,000. Mentor, Vol. I, pp. 170-171.

[1] Seguin: On Idiocy.

Although the teachers of defectives had to consider "the standpoint of the child" in the formulation of their methods, yet the prevailing educational theories of the time dominated them and gave the prevailing direction to their practice. They held to the typical ideal man and consequently to the average child who was to be transformed into this ideal. The blind child shows a vast mental lacuna due to his lacking sense. He is deficient in the sense which gives knowledge of form, color, size and relation. Consequently, in order to make him as much like the seeing as possible, one must seek by means of a substitution sense to give him this knowledge. Touch came the nearest to filling this need, and "touchableness" became the end of the pedagogy of the blind.

Perception involves clear and distinct apprehension and the power of reproduction or perception expression. For the blind this means the apprehension of things through touch and consequently the emphasis of sense training and Pestalozzi's perception principles.

But do touch and vision agree as much as they seem to at first sight? Although touch wants the series of light and color yet it can give us form and size. But a great many objects that are capable of being grasped give no or an uncertain *vorstellung* as, for example, insects, flowers and the small forms of plant and animal life. With objects of large dimensions as woods, fields, city, roof, the case is the same. Touch can give no idea of these, or even at best only a very indeterminate and inadequate one. Magnified and diminished models are used, but seem to be of doubtful worth. Teach a blind child about mountains by means of little piles of sand, or of rivers by artificial rills. The memory image connected with these words will be that of sand piles and rills, and leads consequently to a very inadequate idea. His idea of distance is much less adequate than that of a seeing child. In fact the blind have not sufficient spatial imagination to translate such models into their proper space relations.

Æsthetically the sensations from touch are not the same as from sight. Expressive states do not mean the same to the blind as the seeing They do not get the same ideas from statues and works of sculpture, for the secondary sensations of hardness, coldness and smoothness enter in and cause more or less interference.

It is impossible to have the blind form perceptions like the seeing. For no matter how much time and trouble were spent to gain this end yet there would always remain a difference.

Hitschmann, himself a blind man, contends that they do not think in touch terms, but in what he calls a "substitution idea" which, he thinks, is similar to the general idea of the seeing. This seems to arise more from the definition of the thing than from experience.

Among seeing people the types of imagination that are found are visual, audile and motile, and if touch terms do appear they are not of definite objects, as tingling from injury, pricks, cuts, blows, goose flesh, etc. The same is true of the touch hallucinations of the insane.

In fact it appears that touch does not give us a definite picture of a particular object, no definite series of touches is associated with a special object. The touch sense differs from the other senses in that its end organ is distributed over the whole body, and any part of the end organ may be brought in contact with an object. And since the tactile corpuscles are variously distributed, the resulting touch picture would depend on the part of the skin stimulated. True the fingers are regarded primarily as *the* touch organ, but here the sense of touch seems to serve more as a guide to motion than to be exercised for its own sake. We have seen that the blind differ from the seeing in the acuteness of their active touch and not in passive touch.

The blind-deaf-mutes are supposed to think in touch or motor terms, but this seems to have been reached by a process of exclusion. Laura Bridgman while thinking formed the words in the manual alphabet also when dreaming.

So it would seem from general consideration that Hitschmann is right in his contention and that the blind must think in either auditory or motor terms. Motor terms must play a large part in their mental acquisitions for it is their chief sense of gaining a knowledge of spatial relations.

There has been a tendency to bad practice on the part of those who make " touchableness " the end of pedagogy of the blind. For it has led them to overburden the mind with the concrete too often leaving generalization to take care of itself.

All this goes to show that we cannot apply the pattern of the seeing to the education of the blind. Their own standpoint must be studied and their particular capabilities developed to the fullest extent. Only then will our practice be sound and only then will we be doing all that we should for this afflicted class.

These considerations will also change the direction of the emphasis in our sense training work. The ear is the educational sense of the blind. Most of his information is received through it, and probably most of his thinking must be done in auditory terms, and the bulk of his knowledge is knowledge of definition. So in training the ear we are training his most useful and important sense.

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